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INVESTOR IN PEOPLE

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REC'D 28 JUN 2000

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REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

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International Application No.

PCT/GB 99/02040

International Filing Date

29 JUNE 1999

29 06 99

United Kingdom Patent Office
PCT International Application

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference

(if desired) (12 characters maximum)

M99/0424/PCT

Box No. I TITLE OF INVENTION

APPARATUS FOR FEEDING SHEET MATERIAL

Box No. II APPLICANT

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

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State (that is, country) of residence:

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This person is applicant for the purposes of:



all designated States



all designated States except the United States of America



the United States of America only



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Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

This person is:

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☐ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE: OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:



agent



common representative

Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)

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☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

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Regional Patent

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- ☐

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Box No. VI PRIORITY CLAIM		<input type="checkbox"/> Further priority claims are indicated in the Supplemental Box.		
Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is:		
		national application: country	national application:* regional Office	international application: receiving Office
item (1)				
item (2)				
item (3)				

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):

* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

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Date (day/month/year)

Number

Country (or regional Office)

Box No. VIII CHECK LIST: LANGUAGE OF FILING

This international application contains the following number of sheets:

request : 3 ✓
 description (excluding sequence listing part) : 5 ✓
 claims : 2 ✓
 abstract : 1 ✓
 drawings : 2 ✓
 sequence listing part of description :

Total number of sheets : 13 ✓

This international application is accompanied by the item(s) marked below:

1. ☐ fee calculation sheet
2. ☒ separate signed power of attorney
3. ☐ copy of general power of attorney: reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other (specify):

Figure of the drawings which should accompany the abstract:

Language of filing of the international application:

English

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

LAWRENCE, John Gordon - Agent

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1. Date of actual receipt of the purported international application: 29 JUNE 1999 29 06 99		
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:		
4. Date of timely receipt of the required corrections under PCT Article 11(2):		
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APPARATUS FOR FEEDING SHEET MATERIAL

This invention concerns apparatus for feeding sheet material, particularly, though by no means exclusively, of corrugated board or card as used in the box and case making industries.

In general, stacked sheets are placed on a feed table against a gate which allows only the lowermost sheet to pass therebeneath under the action of forwarding means such as a reciprocating vacuum suction cup, feed rollers or a kicker mechanism, to be fed to take-up means such as the nip between take-up rolls or gripper bars for example of a converting machine such as a rotary die cutter.

It is, of course, essential that the leading edge of each sheet is presented to the take-up means at precisely the correct instant in each machine cycle.

To this end prior known sheet feeding apparatus has relied upon the leading edge of each sheet being at a defined position at the commencement of feed. Many factors, including premature movement of a sheet by continuing rotation of feed rollers after the previously fed sheet has cleared them, mechanical tolerances, improper stacking of the sheets on the feed table, sheet quality and even atmospheric conditions can cause the leading edge of a sheet to be displaced from the expected defined position at the commencement of feed.

It is an object of the present invention to provide sheet feeding apparatus which overcomes the difficulties aforesaid.

According to the present invention there is provided apparatus for feeding sheet material sequentially on demand to processing machinery having a take-up mechanism comprising a feed table having a gate and upon which sheets may be stacked against the gate which allows only the lowermost sheet to pass therebeneath, means driven by a servo-motor to advance the lowermost sheet beneath the gate to the take-up mechanism, a sensing means between the gate and the take-up mechanism to detect the passage of the leading edge of the sheet, a microprocessor which receives data indicating the position of the take-up mechanism and from the sensing means and programmed to control the servo-motor to ensure that the leading edge of the sheet presents itself to the take-up mechanism at the correct instant.

The microprocessor may also be programmed to ensure that the leading edge of the sheet presents itself to the take-up mechanism at a desired speed.

The take-up mechanism may comprise a pair of take-up rolls.

The desired speed may be slightly less than the speed at which the take-up mechanism forwards the sheet.

The take-up mechanism may comprise gripper bars.

The desired speed may be zero.

The means driven by the servo-motor may comprise a bed of rollers within the surface of the table which are rotatably driven to advance the lowermost sheet beneath the gate to the take-up mechanism when forward drive to the rollers is arrested and means to allow the rollers to free-wheel once the lowermost sheet is being advanced thereover by the take-up mechanism.

The invention will be further apparent from the following description with reference to the figures of the accompanying drawings which show, by way of example only, one form of apparatus embodying same.

Of the drawings:-

- Figure 1 shows a side elevation of the apparatus; and
- Figure 2 shows a cross-section through the apparatus
on the line II-II of Figure 1.

Referring now to the drawings, it will be seen that the apparatus comprises a feed table 10 upon which a stack of sheets S may be placed against a gate 11 beneath which only the lowermost sheet in the stack may pass.

Successive sheets are advanced beneath the gate 11 into the nip of take-up rolls 12 by a bed 13 of rollers 14 within the surface of the table. The take-up rolls 12 forward the successive sheets in timed sequence to processing machinery such as a rotary die-cutter.

The rollers are mounted within a chamber 15 to which vacuum suction is applied to pull the lowermost sheet downwardly thereagainst.

The rollers 14 advance the lowermost sheet by being rotatably driven as indicated by the arrows X. Once the sheet is advanced by the rolls 12 drive to the rollers 14 ceases and they are allowed to free-wheel as the sheet is drawn thereover, the rollers 14 having sprag clutches between their inner peripheries and their drive shafts 16. As

the next sheet in the stack drops onto the rollers 14 their free-wheeling rotation is arrested.

The drive shafts 16 are rotatably interconnected by timing drive belts 17 and one shaft is driven by a timing belt 18 itself driven intermittently in a forward direction only by a servo-electric motor 21 which stops whilst a sheet is being advanced by the take-up rolls 12 and which operates at a timed sequence demanded by the processing machinery.

In accordance with the invention the servo-motor 21 is controlled by a microprocessor 30 which receives data from a pulsed shaft encoder 31 indicating the rotational position of the take-up rolls 12 and also from a sensing means comprising a high speed fibre optic sensor 32 between the gate 11 and take-up rolls 12 detecting passage of the leading edge of a sheet being fed.

The microprocessor 30 is programmed to control the servo-motor 21 to ensure that the leading edge of each sheet presents itself at the nip between the rolls 12 at precisely the correct instant and at a desired speed.

It will be understood that the exact position of the leading edge of any sheet at the commencement of feed is immaterial, since control is determined from the datum position of the sensor 32.

It will be appreciated that it is not intended to limit the invention to the above example only, many variations, such as might readily occur to one skilled in the art, being possible, without departing from the scope thereof as defined by the appended claims.

Thus, for example, the take-up mechanism might comprise gripper bars when the microprocessor would be programmed to present the leading edge to the gripper bars at the correct instant but at zero speed.

Again, for example, vacuum suction might be applied to the sheet in the stack above the sheet being fed to prevent the free-wheeling rollers from displacing that sheet prematurely or means may be provided to brake the free-wheeling rollers as soon as the sheet being fed clears them thus reducing the amount of correction which might otherwise be required by the microprocessor.

CLAIMS

1. Apparatus for feeding sheet material sequentially on demand to processing machinery having a take-up mechanism comprising a feed table having a gate and upon which sheets may be stacked against the gate which allows only the lowermost sheet to pass therebeneath, means driven by a servo-motor to advance the lowermost sheet beneath the gate to the take-up mechanism, a sensing means between the gate and the take-up mechanism to detect the passage of the leading edge of the sheet, a microprocessor which receives data indicating the position of the take-up mechanism and from the sensing means and programmed to control the servo-motor to ensure that the leading edge of the sheet presents itself to the take-up mechanism at the correct instant.
2. Apparatus according to claim 1 wherein the microprocessor is programmed to ensure that the leading edge of the sheet presents itself to the take-up mechanism at a desired speed.
3. Apparatus according to claim 2 wherein the take-up mechanism comprises a pair of take-up rolls.
4. Apparatus according to claim 3 wherein the desired speed is slightly less than the speed at which the take-up mechanism forwards the sheet.
5. Apparatus according to claim 2 wherein the take-up mechanism comprises gripper bars.
6. Apparatus according to claim 5 wherein the desired speed is zero.

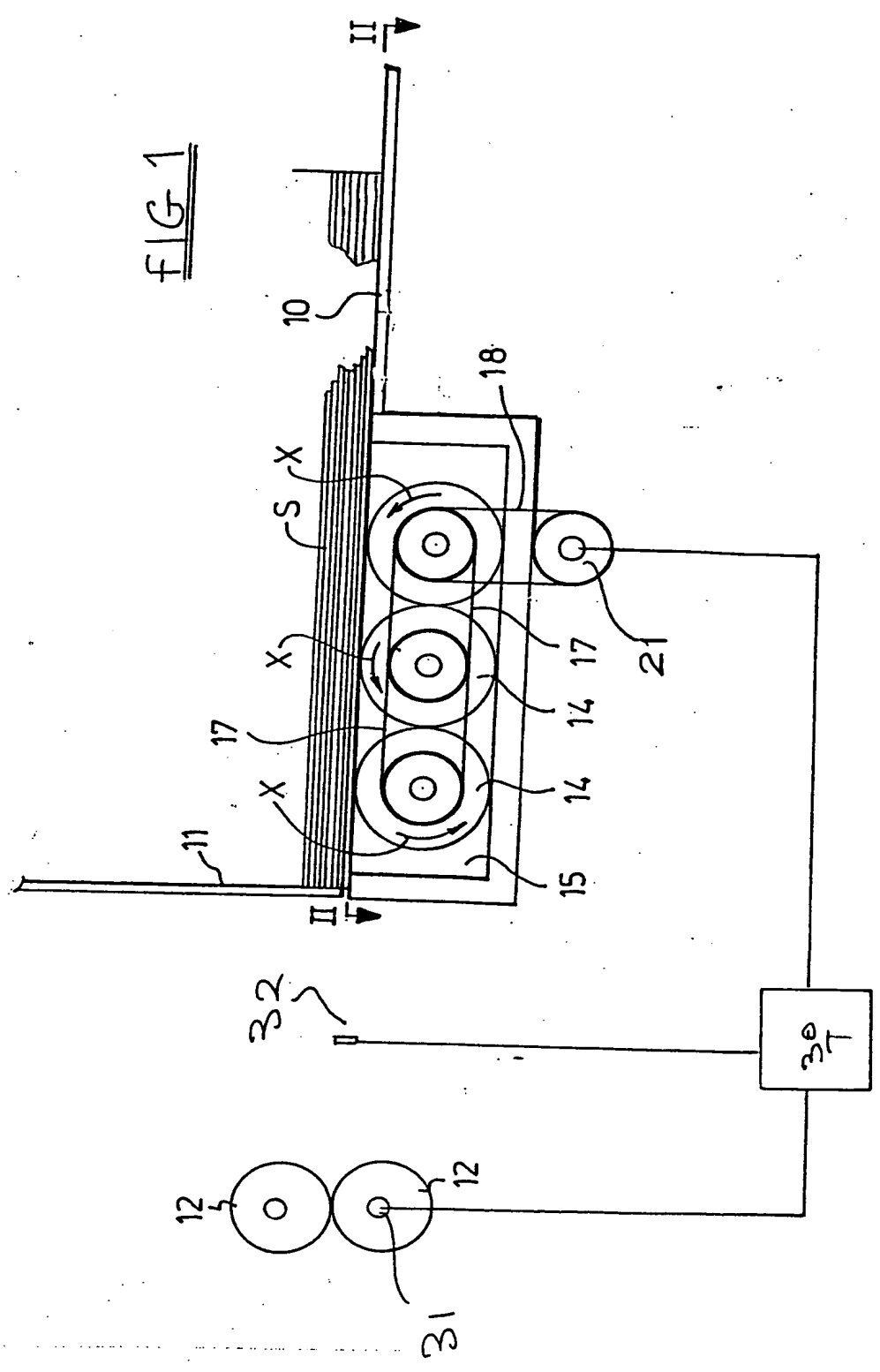
7. Apparatus according to any preceding claim wherein the means driven by the servo-motor comprises a bed of rollers within the surface of the table which are rotatably driven to advance the lowermost sheet beneath the gate to the take-up mechanism when forward drive to the rollers is arrested and means to allow the rollers to free-wheel once the lowermost sheet is being advanced thereover by the take-up mechanism.

ABSTRACT**Apparatus for Feeding Sheet Material**

There is disclosed apparatus for feeding sheet material sequentially on demand to processing machinery having a take-up mechanism comprising a feed table having a gate and upon which sheets may be stacked against the gate which allows only the lowermost sheet to pass therebeneath, means driven by a servo-motor to advance the lowermost sheet beneath the gate to the take-up mechanism, a sensing means between the gate and the take-up mechanism to detect the passage of the leading edge of the sheet, a microprocessor which receives data indicating the position of the take-up mechanism and from the sensing means and programmed to control the servo-motor to ensure that the leading edge of the sheet presents itself to the take-up mechanism at the correct instant.

1/2

FIG 1



2/2

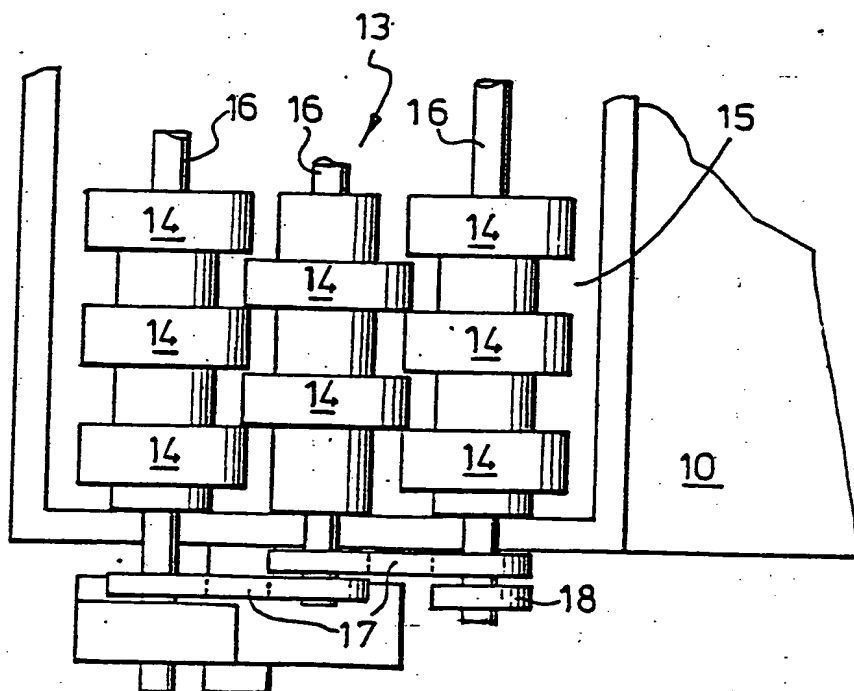


FIG.2